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RAVEN

SEATTLE CITY LIGHT WORK ORDER #90-6

1990 AUTUMN MONITORING OF THE GEORGETOWN FLUME

1-24-91

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SCL 05532

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January 24, 1991

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I. INTRODUCTION

The Georgetown Steam Plant Flume System is a watercourse that connects the inactive steam plant drain tunnel to Slip #4 in the Duwamish Estuary. In November 1985, PCB-contaminated sediments were removed from the Georgetown Flume System. PCB-contaminated soils in the catch basin area of the Steam Plant Yard were also excavated during the 1985 cleanup. In March 1987, the Boeing Company was given a 90-day notice of cancellation of its permit to dispose process cooling water into the flume. The permit was later revoked by City Light. The Boeing Company subsequently sealed the storm drain spouts and plumbing that discharged its cooling water into the flume. In April 1987, Raven Services Corporation undertook a project authorized by Seattle City Light Work Order #87-5 to determine if any new PCB contamination had reentered the system. This study was conducted to comply with a Department of Ecology [WDOE] order. Results of the 1987 study indicated that some recontamination of the flume system had occurred. Documentation and chronology of the recontamination of the flume system was presented in the report for Work Order #87-10, page 16. Additional flume monitoring occurred in July 1988, as authorized by Seattle City Light Work Order #88-12, to assess the extent of PCB contamination. In 1989, quarterly monitoring was authorized by Work Order #89-6, and consisted of spring, autumn and winter monitoring only. The quarterly monitoring program is scheduled to continue in the future until the flume is either closed or filled in. The location of the flume in relation to the City is shown in Figure 1.

The structure of the flume interior lining changes from concrete to wood in the downstream direction between the mouth of the double pipes and the tide gates. In 1989, an additional sampling project was initiated to determine concentrations inside the wood plank lining of the flume. Wood cores from planks north of Myrtle Street were collected and analyzed during autumn and winter monitoring [1989]. Wood core testing was completed during the spring monitoring conducted 8 June 1990 near the end of the rainy season. The 1990 spring quarter monitoring involved reassessment of PCB concentrations in the 1985 cleanup area. Summer quarter monitoring was conducted on 23 August 1990 during the dry season. Autumn monitoring was conducted on 29 October 1990, after the beginning of the rainy season, and is reported here.

II. SAMPLE METHODOLOGY

A. Sampling Strategy

In accordance with EPA SW-846, "Test Methods for Evaluating Solid Waste," a sampling strategy was chosen from sections most analogous to the nature of the site. These sections were 1.4.3 and 1.4.4. The sampling scheme for flume sediments consisted of a pattern of collection points established in 1987. The present sample locations were chosen consistent with that pattern.

B. Container and Sampling Equipment

All samples were placed in pre-cleaned, 270 ml wide-mouth glass containers. Screw cap lids were lined with aluminum foil. The precleaning procedure involved scrubbing with a special petrochemical dissolving soap [HarborMaster Products, Inc., Edmonds, Washington]. A final rinsing with methylene

chloride was undertaken to remove any invisible greases and detergent residues.

Scoops were laboratory grade stainless steel. Before use, all tools were buffed free of rust, cleaned with petrochemical dissolving soap, and rinsed with methylene chloride.

C. Field Observations

Data on the collection process and observations of the physical nature of the samples were kept in the bound field log book. The format for this book is chronological.

D. Sample Collection

Method 8080 in the EPA SW-846 manual describes the protocol for handling organochlorine pesticides and polychlorinated biphenyls. Compliance with these instructions necessitated using glass containers and specified conditions for refrigeration. All samples in our case were delivered to the laboratory in time to comply with the maximum seven days storage for extraction and thirty days for complete analysis.

Flume sediments were shallow, nominally 0-2 inches thick. A few sand berms were formed along the flume bottom by tidewater action, and a few were built up to several inches thick at the time of sampling. Where the flume sediments were less than 2" thick, the entire depth was collected in the subsample. Where the sediment thickness was greater than 2", the vertical extent of the subsample collected was 2". Since access to the sample sites

was restricted by the wire heavy mesh across the top of the flume, a special device was used in the form of an 8 cm stainless steel spoon bent to a 90° angle and attached to a 1/2" diameter 7' long stainless steel pipe. The spoon was ferreted through holes in the mesh and used as a scoop against the floor of the flume. Compositing was accomplished in a stainless steel 30 cm diameter mixing bowl. Sampling locations are shown in Figure 2. A physical description of the samples is provided in Table II.

E. Analysis

Samples, stored no longer than five days at 4° C, were extracted with methylene chloride and taken up with pesticide grade hexane. Samples were pre-treated with Florisil filters to remove residues that interfere with the PCB determination [cleanup modification of USEPA Method 3540, as specified by 40CFR136]. The samples were analyzed by a modification of the packed column gas chromatography procedure described in Method 3550 using a capillary column. The automated gas chromatograph [Waters Corp Dimension-1] with electron capture detector was used. Concentrations below 0.05 ppm were below the detection limit for all Aroclors except 1260. The detection limit for 1260 was 0.1 ppm.

III. RESULTS

Temperatures, as recorded with the ±0.05 C immersion thermometer were air: 7.8°C; water in the flume head: 10.0°C; water at double pipes head: 9.4°C. State of the tide was 2.0' referenced to Seattle Tides. The flume had been emptying of

tidewater since 12:21 a.m. The tide began to rise from +2.9 feet at 6:29 a.m. Sample collection began at 7:10 a.m.

The PCB results are listed by Total Concentration in Table I. The PCB total concentrations are shown at their locations in Figure 2. Also, in Table I, the results of the spring and summer monitoring are presented. One composite sample from the flume head near the tunnel entrance contained 19 ppm; near the mouth of the flume head, 0.9 ppm was found; at the head of the double pipes, 0.6 ppm was reported. In the composite of four subsamples above the tidegates, 0.2 ppm was found. Below the tidegates, the composite concentration was reported to be 0.2 ppm. In samples near the Willow Street Bridge, 0.1 ppm was found. At Slip 4, the combined two shallow cores yielded a concentration of 0.5 ppm.

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SAMPLE LISTINGS

TABLE I

Sample #/ # Subsample	Location	PCB* Concentration (ppm) Autumn Total	PCB Concentration (ppm) Summer Total	PCB Concentration (ppm) Spring Total
GS-1 /2	Flume head	19	25.5	33.9
GS-2 /2	Flume head	0.9	0.6	1.5
GS-3 /2	Double pipe head	0.6	25.1	<0.1
GS-4 /4	Above tidegates	0.2	0.2	0.3
GS-5 /4	Below tidegates	0.2	0.1	<0.1
GS-6 /2	Willow St. Bridge	0.1	<0.1	<0.1
GS-7 /2	Slip #4	0.5	<0.1	<0.1

* Aroclor 1254 was the only Aroclor detected in the autumn samples.

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SAMPLE DESCRIPTIONS

TABLE II

Sample #/ # Subsample	Location	Description
GS-1 /2	Flume head east end, four feet from barrier	Water was 9" deep. Sediments were 2" deep of violet-brown sand above anerobic mud with oily streaks. Sediments supported a grassy moss growth.
GS-2 /2	Flume head west end, two feet from drain	1" of brown silt and black and rust-colored clay above 1" of black sand supporting weed-like grass 1" long. Sample was full roots from the grass.
GS-3 /2	Double pipes head	Very little water. Black, sandy organic-laden mud with old humus of decayed leaves and small pebbles. Sediment was <2" deep and littered on top with styrofoam packing (p-nuts).
GS-4 /4	Above tide gates	Upstream: brown sand over black humus and clay, supporting blue mossy plants. Islands are 4" thick. Downstream: some construction sand swirled by tides into berms, 0 - 4" thick, and clumps 0-6" thick.
GS-5 /4	Below tide gates	Wood is bare immediately below the gates. Upstream: gray and black fine clay/sand 1 - 2" thick supporting blue-green mossy plants. Downstream: fine sandy berms to 3" thick running into brown smooth mud.
GS-6 /2	Willow St. bridge	Upstream: fine brown and black silt and humus about 2" thick. Downstream: dark brown construction sand berms 2 - 4" thick.
GS-7 /2	Slip 4	Subsamples were taken 1' west of the left side of the outfall and 2' east of the centerline of the outfall. Sediment was cored to a depth of 4" with a 1-1/2" diameter acrylic tube. The tidewater was 1' deep. Sediment contained light brown leafy silt and humus.

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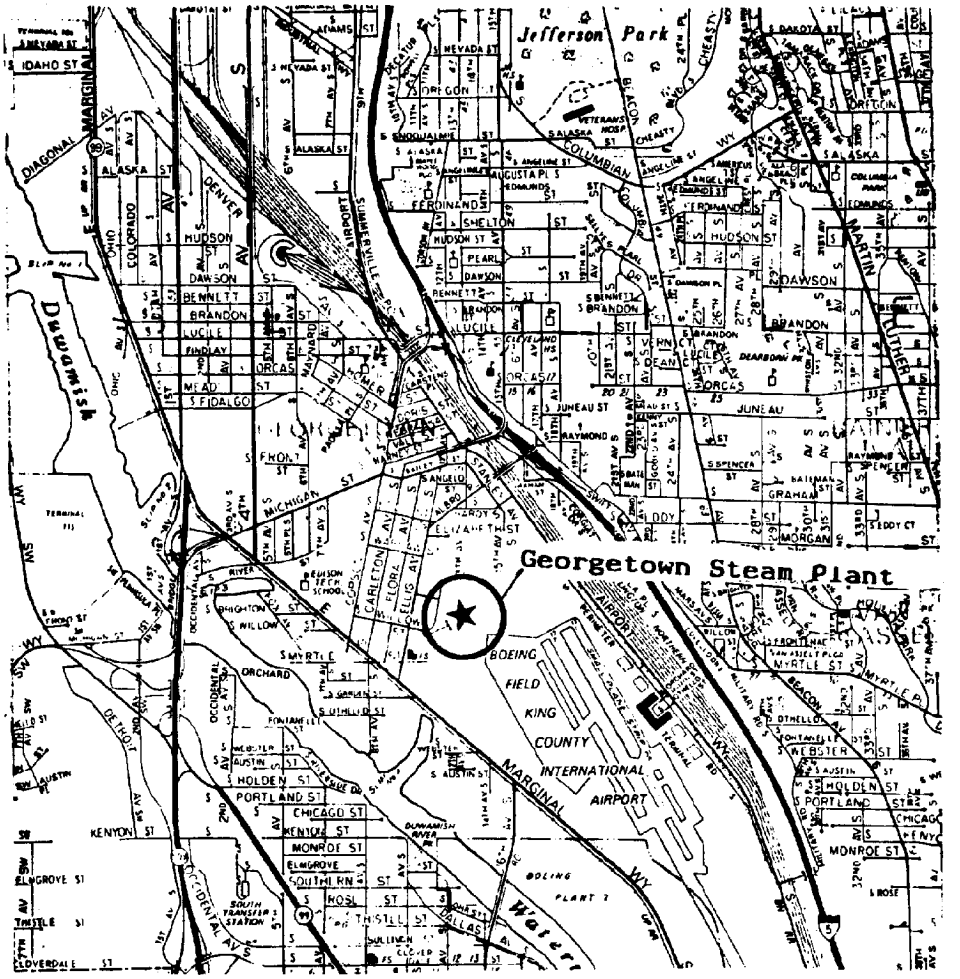
FIGURE 1 - GEORGETOWN STEAM PLANT
VICINITY MAP

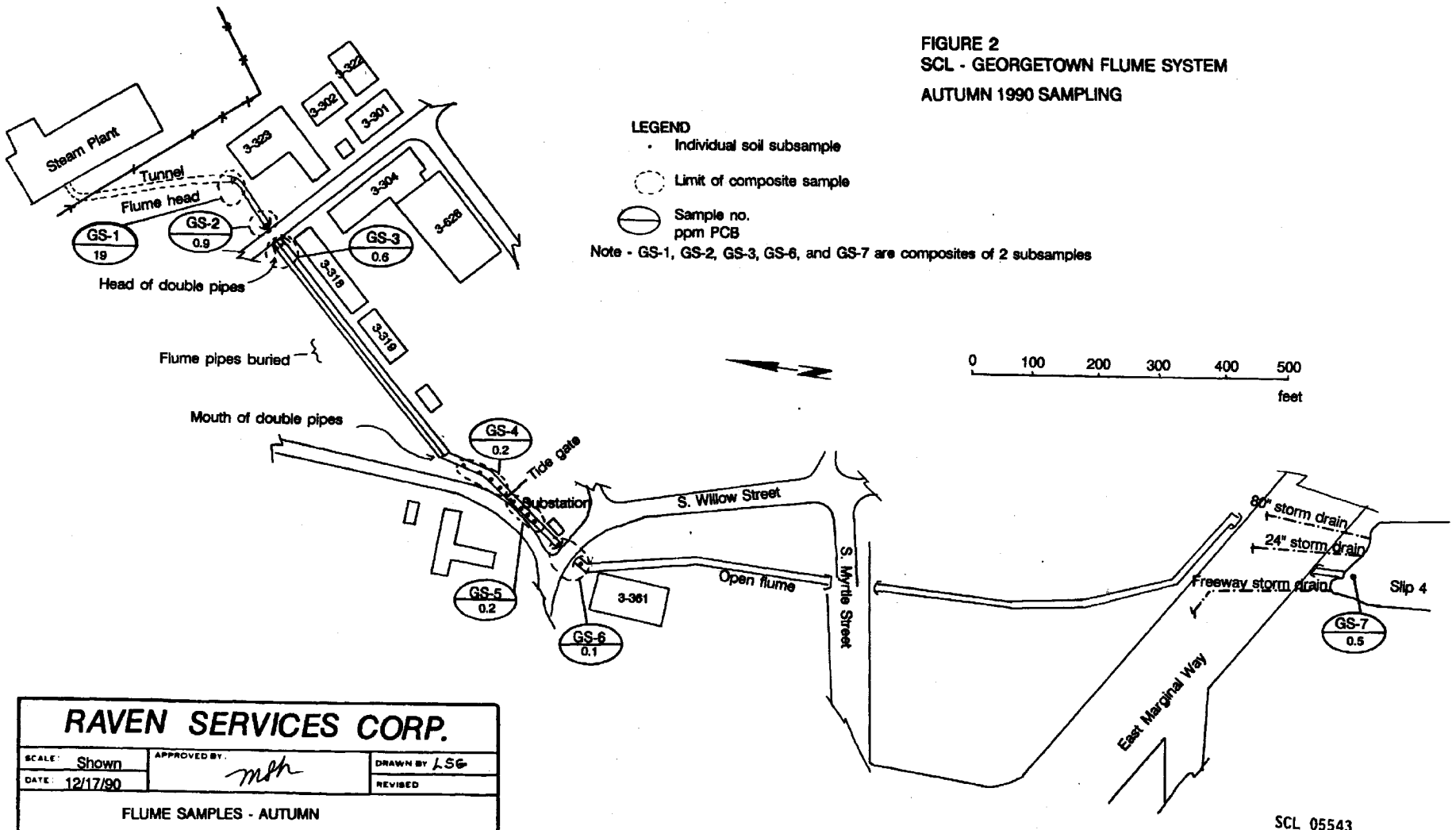


RAVEN SERVICES CORPORATION		
SCALE: 1" = 2560 ft	APPROVED BY: mbl	DRAWN BY LSG
DATE: 12-17-90		REVISED
SW GEORGETOWN DISTRICT		SCL 05542
SEATTLE CITY LIGHT		DRAWING NUMBER 90-6-1

CTY0050449

SEA290918

FIGURE 2
SCL - GEORGETOWN FLUME SYSTEM
AUTUMN 1990 SAMPLING



RAVEN SERVICES CORP.		
SCALE: Shown	APPROVED BY: mph	DRAWN BY: LSG
DATE: 12/17/90		REVISED
FLUME SAMPLES - AUTUMN		
SEATTLE CITY LIGHT		DRAWING NUMBER 90-6-2

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